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CLINICAL COMMENTARY

MERALGIA PARESTHETICA: A REVIEW OF THE LITERATURE

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ABSTRACT

Background and Purpose: Meralgia Paresthetica (MP) is a nerve entrapment which may cause pain, paresthesias, and sensory loss within the distribution of the lateral cutaneous nerve of the thigh. When the differential diagnosis of lateral or anterolateral thigh pain is inconclusive, MP should be considered as a potential source. MP produces similar signs and symptoms as those associated with more common diagnoses such as lumbar spine pathology. This clinical commentary will review the most relevant literature on MP with an emphasis on recognition and management of this condition.

Description of Topic with Related Evidence: The authors reviewed the most relevant published literature on MP from 1970 to 2013 located using the databases PubMed, CINAHL, and Proquest.

Discussion/Relation to Clinical Practice: MP still remains a diagnostic challenge since it can mimic other common diagnoses. Understanding the current literature surrounding the diagnosis and treatment of MP is essential for clinicians practicing in the outpatient environment. The consensus on the most effective non-surgical and surgical interventions is still limited, as is the research on physical therapy interventions for this condition. Perhaps the lack of research and global consensus represents a knowledge deficit that makes MP a challenge to diagnose and successfully treat. Future collaborative studies are needed to improve the clinical diagnostics and understanding of interventions for this pathology.

Key Words: Hip Pain, lateral cutaneous nerve of the thigh, Meralgia Paresthetica, nerve entrapment

Level of Evidence: 5

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BACKGROUND

Meralgia Paresthetica (MP) is a nerve entrapment resulting in pain, paresthesias, and sensory loss within the distribution of the lateral femoral cutaneous nerve or in more contemporary terms, the lateral cutaneous nerve of the thigh (LCNT).[1] MP most often occurs in 30 to 40 year old individuals with a reported incidence rate of 4.3 cases per 10,000 patient years in the general population and 247 cases per 100,000 patient years in individuals with diabetes mellitus.[2-4] MP has a higher predilection in adult males than females and can technically occur at all ages.[5] Several investigators have also reported the occurrence of MP in various sports and physical activities including: gymnastics, baseball, soccer, body building, and strenuous exercise.[6-10] Most of these investigations were case reports with no common correlation or injury mechanism reported.

The paucity of research and lack of global consensus on the recognition and management has made MP a challenge to diagnose and treat. MP was first described by Hager in 1885 and eventually named by Roth in 1895.[1,11] MP has also been referred to as Bernhardt-Roth syndrome or LCN (lateral cutaneous nerve) neuralgia.[12,13] MP has been commonly reported in the eastern medical literature with fewer publications in the western medical literature. During the differential diagnosis of lateral or anterolateral thigh pain, MP should be considered as a potential cause if the more common diagnoses such as an upper lumbar nerve root (L1-L3) problem or trochanteric bursitis have been ruled out or if the individual has been refractory to treatment. The purpose of this clinical commentary is to review the most relevant literature on MP published between 1970 to 2013 with an emphasis on recognition and management of this condition.

Anatomical Characteristics

The LCNT is part of the lumbar plexus. It functions primarily as a sensory nerve and its composition varies among individuals with several different combinations of lumbar nerves that originate from L1 to L3.[1] The LCNT then emerges at the lateral border of the psoas major, crosses the iliacus, to the anterior superior iliac spine. The nerve then passes under the inguinal ligament and over the sartorius muscle and enters the thigh as it divides into an anterior and posterior branch.[14,15]

This anatomical course has traditionally been accepted by researchers and clinicians. However, researchers have demonstrated variability in the nerve's course as it exits the pelvis. Azmann et al have classified 5 different variations in the LCNT discovered through their cadaveric investigation (Table 1).[16] These variations have also been documented by other investigators.[11,15,17] Compression of the LCNT most commonly occurs as it exits the pelvis.[18] The anatomical variations may clinically present with different signs and symptoms due to the unique course the nerve may take as it provides sensory innervation to the anterolateral thigh. A working knowledge of these potential variations can be useful for the clinician during their examination

Table 1. *Anatomical variations of the lateral femoral cutaneous nerve.*

Types	Percentage	Anatomic Location
Type A	4%	Posterior to the anterior superior iliac spine, across the iliac crest.
Type B	27%	Anterior to the anterior superior iliac spine and superficial to the origin of the sartorius muscle but within the substance of the inguinal ligament.
Type C	23%	Medial to the anterior superior iliac spine, ensheathed in the tendinous origin of the sartorius musde.
Type D	26%	Medial to the origin of the sartorius muscle located in an interval between the tendon of the sartorius muscle and thick fascia of the Iliopsoas muscle, deep to the inguinal ligament.
Type E	20%	Most medial and embedded in loose connective tissue, deep to the inguinal ligament, overlying the thin fascia of the iliopsoas muscle, and contributing to the femoral branch of the genitofemoral nerve.
*Type A, B,C		Most susceptible to mechanical trauma.

as well as when establishing and or making adjustments to a plan of care.

ETIOLOGICAL FACTORS

Grossman et al classified MP as being idiopathic or iatrogenic with a sub classification of idiopathic as mechanical or metabolic.[19] This section will provide a summary of common etiologies within each category.

Idiopathic

Mechanical factors can result in compression of the LCNT along its anatomical course.[19] MP has been related to the following factors: obesity (BMI ≥ 30), pregnancy, tight garments such as jeans, military armor and police uniforms, seat belts, direct trauma, muscle spasm, scoliosis, illiacus hemotoma, and leg length changes.[3,20-31] Metabolic factors reported include diabetes mellitus, alcoholism, and lead poisoning.[19]

Iantrogenic

MP has also been reported as a post-surgical complication after hip joint replacement and spine surgery. Goulding et al examined the occurrences of injury to the LCNT in 192 patients who underwent anterior approach total hip arthroplasty (85 THA) and hip resurfacing (107 HR).[32] The authors used self-administered questionnaires including neuropathic pain scores, visual analog scale (to quantify pain), SF-12 (to quantify overall health), UCLA activity scale (to quantify activity level), and the WOMAC (to quantify pain, stiffness, and physical function) as their outcome measures. They found that 170 patients (81%) had a reported LCNT neuropraxia with a mean severity score of 2.32/10 and a mean neuropathic pain score of 2.42/10 one year post-operatively. Anterior approach hip resurfacing (91%) had a higher incidence than anterior approach total hip arthroplasty (67%). Despite the seemingly common presence of MP symptoms in the subjects in the aforementioned studies the subjects reported an absence of functional limitations with the SF-12, UCLA activity scale, and WOMAC.[32] Bhargava et al reported similar findings in a retrospective case review of 81 patients who underwent anterior approach THA. They also found similar symptoms among patients with no apparent functional deficits.[33]

Post-surgical spine patients have also experienced MP. Gupta et al reported on the incidences of MP in 110 patients (66 males, 44 females) (15 to 81 years; mean 46.9 yrs.) who underwent posterior lumbar spine surgery.[34] Thirteen patients (12%) suffered from MP after surgery. The authors hypothesized that when the patient is prone the anterior hip gets compressed from the surgical equipment utilized during surgery, which led to the onset of MP.[34] Other authors have reported equipment related incidents in individuals who underwent direct lateral and posterior lumbar spinal surgery.[35-38]

MP has also been reported, to a lesser extent, as a post-surgical complication in iliac bone harvesting, open and laparoscopic appendectomy, cesarean with epidural analgesics, and obstetric and gynecological surgery.[39-43]

CLINICAL PRESENTATION

Patients may complain of pain, burning, numbness, muscle aches, coldness, lightning pain, or buzzing (like a cell phone) in their lateral or anterolateral thigh (Figure 1).[1,19,44] The patient may have mild symptoms with spontaneous resolution or may have more severe pain that limits function.[1,19] Patients may report pain with prolonged standing and walking, and alleviation with sitting.[19,45] Theoretically, sitting may reduce or change the tension in the LCNT or inguinal ligament, thus reducing symptoms. Each client will have their own unique clinical presentation and distribution of symptoms. This is further

Figure 1.

supported by Seror and Seror who documented their experience with diagnosing 120 cases of MP (69 men, 51 women, and age range 15-81 years, duration of symptoms 2 weeks to 20 years) using neurophysiological studies.[46] They found that the lateral thigh was solely involved in 88 (73%) cases and the anterolateral thigh was involved in 32 (26%) cases. The right thigh was involved in 62 (51.6%) cases and the left in 58 (48.3%) cases.[46]

In addition to the patient's unique clinical presentation, they may present with concomitant musculoskeletal deficits. Ahmed reported on a case where femoral acetabular impingment (FAI) was associated to MP.[47] The patient was diagnosed with FAI but also developed several musculoskeletal deficits such as excessive anterior pelvic tilting and soft tissue tightness in the anterior hip. The author hypothesized that the anatomical variability of the lateral femoral cutaneous nerve, excessive anterior pelvic tilt, contraction of the inguinal ligament, and shortening of the iliopsoas muscle, may all have contributed to the development of MP in the patient.[47]

CLINICAL TESTING

Before considering MP as a cause of the patient's symptoms, clinicians may want to first rule out common pathologies. MP is often considered an elusive diagnosis since it can mimic the neurological symptoms (e.g. numbness, paresthesias) that present with other more common causes of anterolateral thigh pain present with such as lumbar stenosis, disc herniation, and nerve root radiculopathy.[48-51] Within the examination process, there are specific clinical tests that can be conducted in order to assist with the differential diagnosis. This section will describe specific clinical tests that are commonly used. A complete description of the hip examination is beyond the scope of this section. The reader is referred to the work by Byrd[52] which provides a description of the hip examination process. Figure 2 also describes an algorithmic approach to the examination of idiopathic MP that may be performed by clinicians.[19]

Pelvic Compression

The Pelvic Compression Test was first described by Nouraei et al in 2007.[53] The patient is positioned in sidelying with their symptomatic side facing up. The examiner applies a downward, compression force to the pelvis (Figure 3) and maintains pressure for 45 seconds. If the patient reports an alleviation of symptoms the test is considered positive.[53] The test is based upon the idea that the LCNT is compressed by the inguinal ligament and a downward force to the innominate will relax the ligament and temporarily alleviate the patient's symptoms. In their study, Nouraei et al evaluated the sensitivity and specificity of the Pelvic Compression Test in a group of 20 patients (mean age 47 $\pm$ 12 years) with LCNT which was confirmed with neurophysiologic testing which is considered the gold standard.[54,55] The authors found that the test had a sensitivity of 95% and a specificity of 93.3%.[53] Despite the favorable results, no other clinical trials have been performed to date. Further research is needed to assess diagnostic ability of this special test in larger controlled trials with a comparison to neurophysiological testing.

Neurodynamic Testing

Neurodynamic testing has also been used as an assessment for adverse mechanical tension of the LCNT. As described by Butler, the patient is sidelying with the symptomatic side up and the bottom knee bent.[50,51] The examiner stabilizes the pelvis with the cranial hand and grasps the lower extremity at the knee with the caudal hand. The examiner then bends the knee and adducts the hip in order to tension the LCNT (Figure 4a, 4b).[56,57] A positive test would be the reproduction of the patient's neurologic symptoms versus feeling tension in the soft-tissue structures of the hip. Neurodynamic testing of the LCNT has not been assessed in the literature for its diagnostic ability. This should be considered when using this test as part of the clinical exam.

Tinel's Sign

The Tinel's sign can also be performed over the LCNT. Parmer reported his clinical experience of reproducing various patient symptoms by administering the Tinel's sign over the LCNT as it exits the inguinal ligament region.[58] Currently, there are no clinical trials that have investigated the diagnostic ability of the Tinel's sign for MP or compared their diagnostic ability against neurophysiological testing. The main focus of the research on the Tinel's sign has been for upper extremity pathologies such as Carpal tunnel syndrome.[59,60]

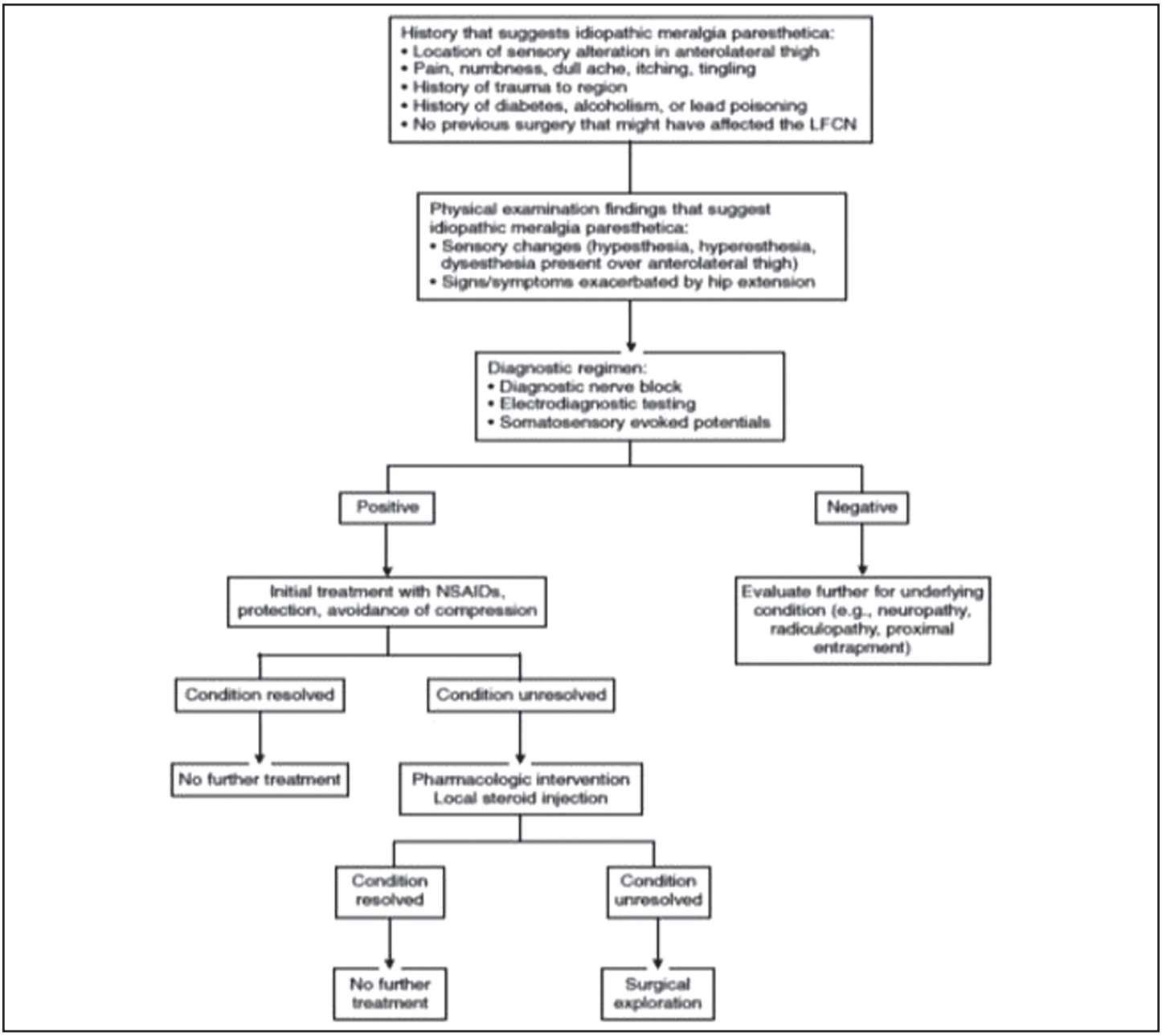

Figure 2.

These are the clinical tests commonly used to diagnose MP. Due to the lack of supporting literature, further research is needed to assess their individual and clustered diagnostic efficacy. Both their strengths and weaknesses should be considered when including them in the examination process.

NEUROPHYSIOLOGICAL STUDIES AND IMAGING

In addition to the clinical examination, MP is often diagnosed using neurophysiological studies such as somatosensory evoked potentials (81.3% sensitivity) and sensory nerve conduction (65.2% sensitivity).[54,61,62] However, it is important to note that, as with most studies, there are limitations to nerve conduction studies examining the LCNT. One such limitation is that among individuals with increased adipose tissue which makes this type of study difficult to perform.[46] More recently, Magnetic Resonance Neurography (MRN) has been utilized to capture direct images of the nerves of the body. This type of imaging is a modification of Magnetic

Figure 3.

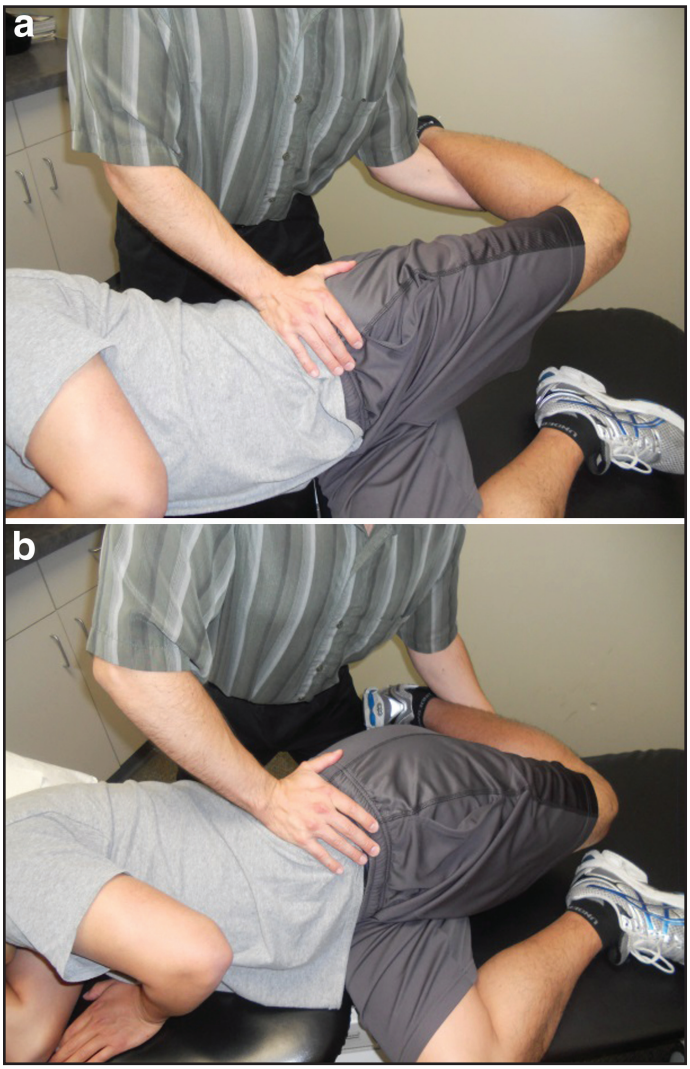

Figure 4.

Resonance Imaging (MRI). MRN produces a detailed image of the nerve from the resonance signals that come from the nerve itself.[63] Chhabra et al assessed the intraobserver reliability among 2 blinded raters in the diagnosis of MP using MRN in a sample of 38 individuals (11MP, 28 Control).[64] The authors found the sensitivity, specificity, positive predictive value, and negative predictive value of MP diagnosis were ≥71% and ≥94% for both raters and the diagnostic accuracy was ≥90% for both raters.[64] Physicians may consider ordering different types of neurophysiological studies or imaging in order to assist in differential diagnosis of the cause of the patient's hip and thigh symptoms.

Nerve Block Test

Along with the testing mentioned above, physicians may also choose to conduct a nerve block test (using 1% Lidocaine) at the site where the LCNT exits the pelvis at the inguinal ligament.[19,24] The approximate site of injection is 1cm medial and inferior to the ASIS or at the point of maximum pain. The test is considered positive if the patient has immediate symptom relief that lasts 30-40 minutes after the injection.[19,24]

NON-SURGICAL AND SURGICAL INTERVENTIONS

The research regarding interventions for MP is sparse compared to other disorders of the hip. In fact, Khalil et al conducted a systematic review of non-surgical and surgical interventions for MP in 2008. The authors found no quasi-controlled or randomized controlled trials. They concluded that the evidence regarding interventions for MP was weak due to a lack of high quality studies.[65] In 2012, the same authors conducted a follow-up analysis and found no quasi-controlled or randomized controlled trials thus concluding that the current evidence is still weak.[66] Therefore, suggested non-surgical interventions that could be used by physical therapists and pulsed radio frequency ablation and nerve blocks are discussed first. Surgical interventions, which include LCNT resection, and LCNT neurolysis are discussed in a subsequent section.

Non-Surgical Interventions

Initial treatment for MP often may include the use of NSAIDS, protection of the area, avoiding com-

pression activities, and physical therapy.[1,19] Other non-surgical interventions include pulsed radiofrequency ablation and LCNT nerve block. Pulsed radiofrequency ablation uses a high frequency alternating current to treat various neuropathic disorders such as MP.[67] The heat generated from the high frequency alternating current ablates (or destroys) the nerve fibers or dysfunctional tissues without damaging the surrounding tissue.[67] The use of pulsed radiofrequency is an emerging treatment for MP. Currently, there are no clinical trials available, only case reports describing this intervention.[67-69]

LCNT nerve blocks using a combination of Lidocaine and corticosteroids are also used in the treatment of MP.[65] Taglifiaco et al reported their results after conducting an ultrasound guided nerve block on 20 patients (7 male, 13 female; age range, 23–66 years) with a diagnosis of MP confirmed by electromyography.[45] They used the pain visual analog scale (VAS) and VAS global quality of life (QOL) scales as their outcome measures. At 1 -week post injection, 16 patients (80%) experienced progressively decreased symptoms and 4 patients (20%) required a second injection due to continued pain. At the 2 month follow-up, all patients experienced a complete resolution of symptoms and significant improvements on the QOL scale.[45] Other authors have found similar outcomes.[70,71] Both interventions have shown successful outcomes and may offer an alternative to surgical intervention.

Surgical Interventions

LCNT neurolysis and resection are optional interventions in cases where non-surgical management has failed. Neurolysis has shown favorable outcomes in individuals up to 4 years following surgery and resection has also shown favorable results despite the complete loss of sensation in the anterolateral thigh that occurs after surgery.[72-75] The overall consensus on which procedure is the best has still not been reached.[72] Emamhadi compared neurolysis versus resection in the treatment of 14 individuals diagnosed with MP with a follow up within 18 months. The author found that the resection group (N = 9) reported complete relief while the neurolysis group (N = 5) reported a recurrence of symptoms within one to nine months.[76] de Ruiter et al also found higher success rates with the resection versus neurolysis.[72] The comparison studies above suggest that LCNT resection produces greater outcomes; however, both procedures are still under researched. The success of LCNT resection may be due to the complete resolution of symptoms and the acceptance of permanent changes (e.g. numbness) by the patient.[72] Consequently, neurolysis may provide symptoms relief but has a probability of recurrence.[76] Thus, neurolysis procedures may be considered first and resection then considered secondarily if the nerve has been severely damaged or the dysfunction returns after neurolysis.[76]

REHABILITATION

The research regarding rehabilitation for MP is sparse with the bulk of the literature being case studies and a few clinical trials.[6,10,26,42,77-81] To date, there is no comprehensive study assessing the efficacy of physical therapy interventions for the treatment of MP. The available literature regarding manual therapy and other interventions including Kinesiotaping ® (KT) and acupuncture for the treatment of MP is discussed below.

Manual Therapy

The available literature regarding manual therapy is composed of two chiropractic case studies describing the management of individuals with chronic MP and one chiropractic case study describing the management of a pregnant female patient with MP.[77,81,82] The treatments reported among the case studies included: Active Release Techniques (ART), mobilization/manipulation for the pelvis, myofascial therapy for the rectus femoris and illiopsoas, transverse friction massage of the inguinal ligament, stretching exercises for the hip and pelvic musculature, and pelvic stabilization/abdominal core exercises.[77,81,82] Based on the available evidence, the aforementioned interventions may be effective and safe in relieving symptoms in individuals who suffer with MP. However, more controlled trials are needed to further assess these interventions. Only one previous study by Terett cites a case where chiropractic manual treatment of the hip and pelvis resulted in MP.[83]

KinesioTaping ® (KT)

Kalichman et al. conducted a pilot study assessing the efficacy of KT on relieving symptoms of MP in a group of 10 individuals (men 6, women, 4; mean

age: 52 years) with a clinical and electromyographic diagnosis of MP over a 4 week period (8 treatment sessions).[78] The authors used the visual analog scale VAS, VAS QOL, and the size of the symptomatic area as their outcome measures. The authors found significant improvements in all measures including a decrease in the patients reported symptoms and symptomatic area after the application of KT.[78] Despite the small sample size, this pilot study suggests that KT may be a good complementary intervention in the treatment of MP. The exact physiological mechanisms are still unknown. KT is hypothesized to help increase lymphatic and vascular flow, decrease pain, enhance normal muscle function, increase proprioception, and help correct possible articular malalignments.[84] Despite the hypothesized benefits, the current evidence is insufficient for MP.[85,86,78] Figure 5a, 5b represent the KT techniques used in this study.

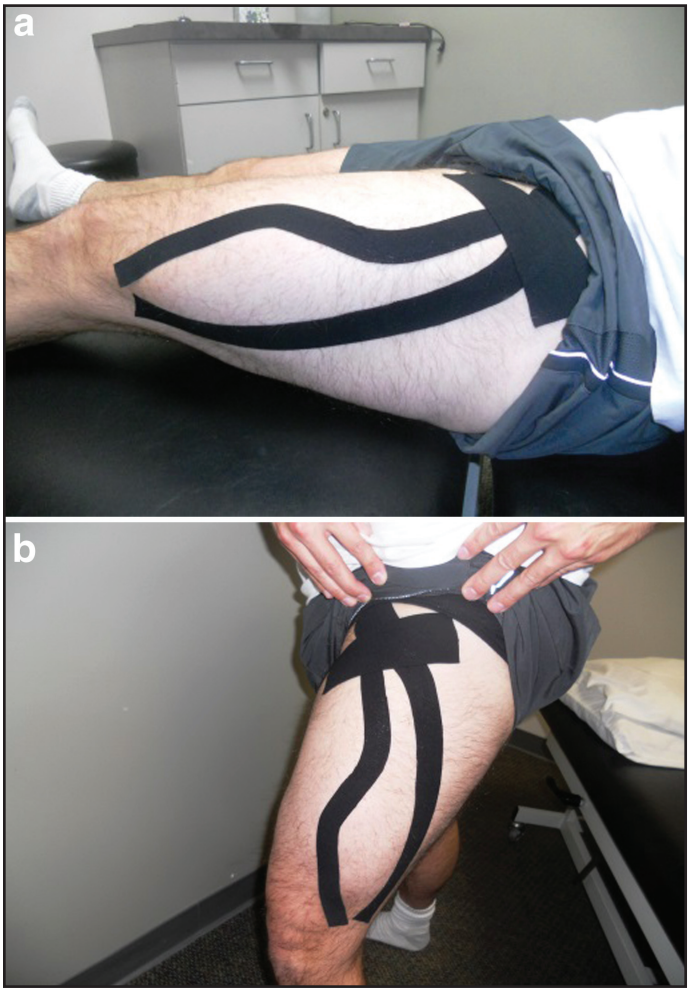

Figure 5.

Acupuncture

The benefits of Acupuncture as an intervention (e.g. needling and cupping) for MP has been shown in clinical trials which have been published mainly in journals of eastern medicine. In fact, a systematic review found 21 studies available on the acupuncture treatment for MP since 1956.[87,88] One particular case study reports the successful treatment of MP with acupuncture in two patients who did not respond well to conventional physical therapy.[89] Another study by Wang et al reported the successful acupuncture treatment of 43 patients diagnosed with MP who underwent an intervention of needling and cupping.[90] The available literature suggests that acupuncture may be effective in the treatment of MP. However, the exact physiological mechanisms are still under investigation.[91,92] Further studies are needed in order to develop a broader understanding regarding the efficacy of acupuncture in the treatment for MP.

The current research regarding interventions for MP is sparse. For the clinician, the available literature does provide some guidance for manual therapy, taping, and acupuncture. However, this is limited to case reports, investigations with small samples, and eastern based studies.[87-89,93] Future collaborative studies are needed from western and eastern researchers in order to develop a global evidence based consensus concerning the efficacy of the interventions in the treatment for MP.

CONCLUSION

This clinical commentary provided discussion on the most relevant literature on MP with an emphasis on recognition and management of this condition. MP still remains a diagnostic challenge since it can mimic more common diagnoses such as lumbar pathology. The consensus on the most effective non-surgical and surgical interventions is still lacking, along with the research on physical therapy interventions. Perhaps the lack of research and global consensus has created a knowledge deficit that makes MP a challenge to diagnose and successfully treat. Future collaborative studies are needed to improve the clinical diagnostics and understanding of interventions for this pathology.

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